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IS 6102-1 (2009): Finger Knobs used in Electronic and Telecommunication Equipment, Part I: General Requirements and Tests [LITD 3: Electromechanical COmponents and Mechnical Structures for Electronic Equipment]

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भाग 1 सामान्य अपेक्षाएँ और परीक्षण

(पहला पुनरीक्षण)

Indian Standard

FINGER KNOBS USED IN ELECTRONIC AND TELECOMMUNICATION EQUIPMENT — SPECIFICATION

PART 1 GENERAL REQUIREMENTS AND TESTS

(First Revision)

ICS 31.220.01

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NEW DELHI 110002

December 2009 **Price Group 3**

Electromechanical Components and Mechanical Structures for Electronic Equipment Sectional Committee, LITD 03

FOREWORD

This Indian Standard (Part 1) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Electromechanical Components and Mechanical Structures for Electronic Equipment Sectional Committee had been approved by the Electronics and Information Technology Division Council.

This standard was first published in 1971. This revision has been undertaken to align it with latest practices in the field of testing of electronic and electric equipment.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be same as that of the specified value in this standard.

Indian Standard

FINGER KNOBS USED IN ELECTRONIC AND TELECOMMUNICATION EQUIPMENT — SPECIFICATION

PART 1 GENERAL REQUIREMENTS AND TESTS

(First Revision)

1 SCOPE

This standard (Part 1) specifies the general requirements and methods of tests for judging the mechanical and climatic properties of knobs intended for use in electronic and telecommunication equipments, and dimension for the purpose of intechangebility and compatibility.

2 REFERENCES

The standards listed below are necessary adjuncts to this standard:

IS No.	*Title*
4586 : 1978	Dimension of spindles and mounting arrangements for spindle operated electronic components
9000	Basic environmental testing procedures for electronic and electrical items :
(Part 1) : 1988	General (*first revision*)
(Part 2) : 1977	Cold test
(Part 3) : 1977	Dry heat test
(Part 4) : 1979	Damp heat (steady state)
(Part 5) : 1988	Damp heat (cyclic) test
(Part 7/Sec 2) : 1979	Impact test, Section 2 Bump
(Part 8) : 1981	Vibration (sinusoidal) test
(Part 10) : 1979	Mould growth test
(Part 11) : 1983	Salt mist test
(Part 14) : 1988	Test N: Change of temperature

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Finger Knobs — A finger operated device for fitting to a standard spindle of a variable electronic component to provide rotary control.

3.2 Collect Assembly — Tests carried out to prove conformity with the requirements of the relevant standard for the knobs, these are intended to check the general qualities and design of a given type of knob.

3.3 Type Tests — Tests carried out to prove conformity with the requirements of the relevant standard for the knobs. These are intended to check the general qualities and design of given type of knob.

3.4 Acceptance Tests — Tests carried out on samples selected from a lot for the purpose of verifying the acceptability of the lot.

3.4.1 *Lot* — All knobs of the same type and category manufactured by the same factory during the same period and using the same materials and processes.

3.5 Routine Tests — Tests carried out on each and every knob to check the requirements which are likely to vary during production.

4 CATEGORIES

There shall be categories corresponding to their ability to withstand climatic severities as detailed below:

Climatic Test	*Severities*		
	Category I	Category II	Category III
Dry heat	+100°C	+ 85°C	+70°C
Cold	–55°C	–40°C	–10°C
Damp heat (long-term)	56 days	56 days	21 days
Damp heat (accelerated)	6 cycles	6 cycles	2 cycles
Rapid change of temperature	+100 to –55°C	+85 to –40°C	Not applicable
Low air pressure	⟵	Not applicable	⟶

NOTE — In case of special requirements where the above categories cannot be applied, different combination of climatic severities may be agreed to between the purchaser and the supplier provided that the degrees of severity are chosen from those specified in IS 9000 (Part 1).

5 MATERIALS AND WORKMANSHIP

5.1 Materials

The knobs shall be constructed from the most suitable materials which shall be free from flaws and conform to relevant to Indian Standard, if any. All materials used in the construction of the knobs shall be such as are not susceptible to any mutual chemical reaction over the entire range of temperature for which the knobs are designed.

5.2 Workmanship

All parts of the knobs shall be manufactured and processed in careful and workmanlike manner in accordance with the good engineering practice.

6 MARKING

6.1 Each knob shall have the following information clearly and individually marked on it:

a) Manufacturer's name or any other registered mark, and

b) Manufacturer's code number (*see* Note).

NOTE — Manufacturer's code number should generally form a party of the compulsory marking; in case it is not possible to mark the same, it shall be included in **6.1.1.**

6.1.1 In addition to the information given in **6.1** the following information shall be marked on a package of knobs:

a) Manufacturer's (finger knobs),

b) Type number (as per individual specification),

c) Category (*see* **4**),

d) Any additional marking, if required by purchaser or any other marking agreed to between the purchaser and the manufacturer, and

e) Country of manufacture.

6.1.2 *BIS Certification Marking*

The knobs or the carton containing the knobs may also be marked with the Standard Mark.

6.2 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which a license for the use of the Standard Mark may be granted to manufacturers or producers, may be obtained from the Bureau of Indian Standards.

7 TESTS

7.1 Classification of Tests

7.1.1 *Type Tests*

Unless otherwise specified, the manufacturer shall supply 18 specimens of each type of construction, category and size for which approval is sought. The sequence of type tests shall be in accordance with Annex A.

7.1.2 *Acceptance Tests*

From the lot which have passed the routine tests (*see* **7.1.3**), two groups of samples one for non-destructive test (Group A) and the other for destructive test (Group B) shall be selected and the samples in each group shall be subjected to the following tests in the order mentioned below:

Group A (Non-destructive)	*Group B (Destructive)*
a) General examination (*see* **7.3.1**), and	a) Eccentricity (*see* **7.3.3**),
b) Dimensions (*see* **7.3.2**).	b) Torque (*see* **7.3.6**),
	c) Bump (*see* **7.3.8**), and
	d) Climatic sequence (*see* **7.4.1**).

7.1.3 *Routine Tests*

Each knob shall be subjected to the general examination test.

7.2 Conditions for Tests

7.2.1 General tests shall be carried out on the knobs as received from the manufacturer or supplier.

7.2.2 *Standard Atmospheric Conditions for Testing*

Unless otherwise specified, all tests shall be carried out under standard atmospheric conditions for testing as specified in IS 9000 (Part 1) .

7.2.3 *Selection of Samples*

The samples for testing shall be selected as to representative of each type and category.

7.2.4 *Pre-conditioning*

Before measurements are made, the knobs shall be stored at the measuring temperature and the relative humidity for a time sufficient to allow the knobs to reach these conditions.

7.2.5 *Drying*

Where drying before measurement is required, it shall be done in accordance with IS 9000 (Part 1).

7.2.6 *Mounting*

Where mounting specified, it shall be done in accordance with the relevant clauses.

7.2.7 *Other Precautions*

During measurements, the knobs shall not be exposed to draughts, direct sun-rays or other influences likely to cause errors.

7.3 Mechanical Tests

7.3.1 *General Examination*

The knobs shall be visually examined for conformity with the following:

a) Workmanship, finish and assembly shall be satisfactory,

b) Moulding shall be clean with flash removed, and free from visible cracks, air bubbles, blisters, charring or other flaws,

c) Metallic portion, where provided, shall be free from burrs and other imperfections. Openings in inserts shall be clear of molding material,

d) Knob assembly shall be complete with all items called for in the drawing,

e) Colour of the knob shall be according to the colour indicated in the drawing or any approved sample mutually agreed to between the customer and the supplier,

f) Fixing screws where provided shall have well formed thread, and

g) Markings shall be in accordance with **6**.

There shall be no deterioration in the features mentioned above after mechanical and climatic tests.

7.3.2 *Dimensions*

The dimensions of the knobs shall be checked and shall comply with those specified in the relevant specification. Any suitable method may be used, except that the gauges should be used where specified in the relevant specification. The dimensions shall be such as to fit properly in the spindles specified in IS 4586.

7.3.3 *Eccentricity*

A spindle of diameter corresponding to the knob shall be mounted at right angles on a panel such as to rotate freely. The cross-sectional dimensions of this spindle shall be the minimum specified in the spindle specification. The knobs shall be properly fitted on the spindle and the spindle is then pushed in so that the knob touches the panel at least at one point. The following two measurements shall then be carried out:

a) *Axial tilt* — Measure the maximum gap between the edge of the knob and the panel. The gap shall be within the specified limit, and

b) *Radial eccentricity* — Eccentricity of the outer edge shall be within the specified limit.

NOTE — A suggested method for measuring the radial eccentricity is to draw closely-spaced concentric circles of various shown diameters on the panel with the centre coinciding with the centre of the spindle axis. The finger knob fitted to the spindle may be mounted. If eccentricity exists, the edge of the knob will touch different circles at various points along with edge. The eccentricity shall be given as follows:

Eccentricity — Half the difference between the maximum and the minimum diameters of the circles touced by the outer edge of the knob.

7.3.4 *Test for Finger Stop (Where Applicable)*

Rotate the knob until it rests on the finger stop. Apply a torque of 0.5 Nm. The knob shall not slide over or foul with the finger stop. It shall not get damaged.

7.3.5 *Adjusted*

Where axial adjustment of the specimen in relation to the spindle is provided, such adjustment shall be checked. The adjustment shall comply with the requirement of the relevant specification.

7.3.6 *Torque (Wherever Applicable)*

The specimens shall be fixed to the appropriate spindle or mounting and a steady torque of 1 Nm shall be applied between the shaft and specimen for 30 s in each direction. If necessary a jig of a design which will not reinforce the ability of the moulding to resist damage due to the test, shall be used to apply the torque. There shall be no damage to the specimen or to the spindle.

7.3.6.1 *For collect assemblies only*

The collect assembly shall be fitted to a spindle (each collect shall be tested on a new piece of 6 mm or any appropriate diameter bright mild steel rod, noting that the collect serrations are free from foreign matter) and tightened to the spindle using a torque spanner loaded to between 6 and 8 Nm. The torque shall than gradually be increased to 11 Nm and at no time shall this be in the form of a ‘snatch load’. The collect shall not slip when the full load is applied.

7.3.6.2 *For anti-vibration assemblies only*

Knob assembly is mounted in normal position on standard spindle so that the anti-vibration device is effective. It shall resist a torque of 0.25 Nm applied to the spindle.

7.3.6.3 *Compression load (for anti-vibration assemblies only)*

Using an adaptor fitted over the cap (*see* Fig. 1), a load shall be applied direct to the face of the knob moulding with a compression type spring gauge. For a deflection of 1.2 mm, the applied load shall be 2.00 ± 0.25 kg. When in depressed position, that is antivibration device disengaged, knob and spindle shall rotate freely. Apply this test in both directions.

7.3.7 *Axial Thrust*

The specimen shall be fitted as in **7.3.6** and a steady axial thrust of 4.5 kgf shall be applied for 30 s in each direction (axial pull and axial thrust) through the normal finger-grip portion of the specimen or to the spindle, and also no movement of the specimen relative to the spindle.

7.3.7.1 *Spring-loaded knobs*

The thrust shall be 2.5 kgf. The knob shall not come out.

7.3.8 *Bump*

The knobs shall be subjected to bump test in accordance with IS 9000 (Part 7/Sec 2) at the specified temperature. The specimen shall be securely fixed to a standard spindle by its normal means and shall be subjected to 4 000 bumps at 40 g. There shall be no mechanical damage to the specimen and no loosening of the attachment to the spindle.

7.3.9 *Vibration*

The specimen shall be fixed to the standard spindle by its normal means and shall be subjected to the vibration test in accordance with IS 9000 (Part 8) for the severities specified in the relevant specification. There shall be no mechanical damage to the specimen and no loosening of the attachment to the spindle.

7.4 Climatic Tests

7.4.1 *Climatic Sequence*

The sequence consists of dry heat, damp heat (accelerated) first cycle, cold and damp heat (accelerated) remaining cycles.

7.4.1.1 *Dry heat*

The knobs fitted on standard spindles by its normal means shall be subjected to this test in accordance with IS 9000 (Part 3). The temperature of the test chamber shall be maintained at the appropriate maximum value for the category.

Whilst still at this temperature the specimen shall be subjected to the following tests and shall meet the requirements specified in the relevant clauses:

a) Torque (*see* **7.3.6**); and
b) General examination [*see* **7.3.1**(a), (b) and (e)].

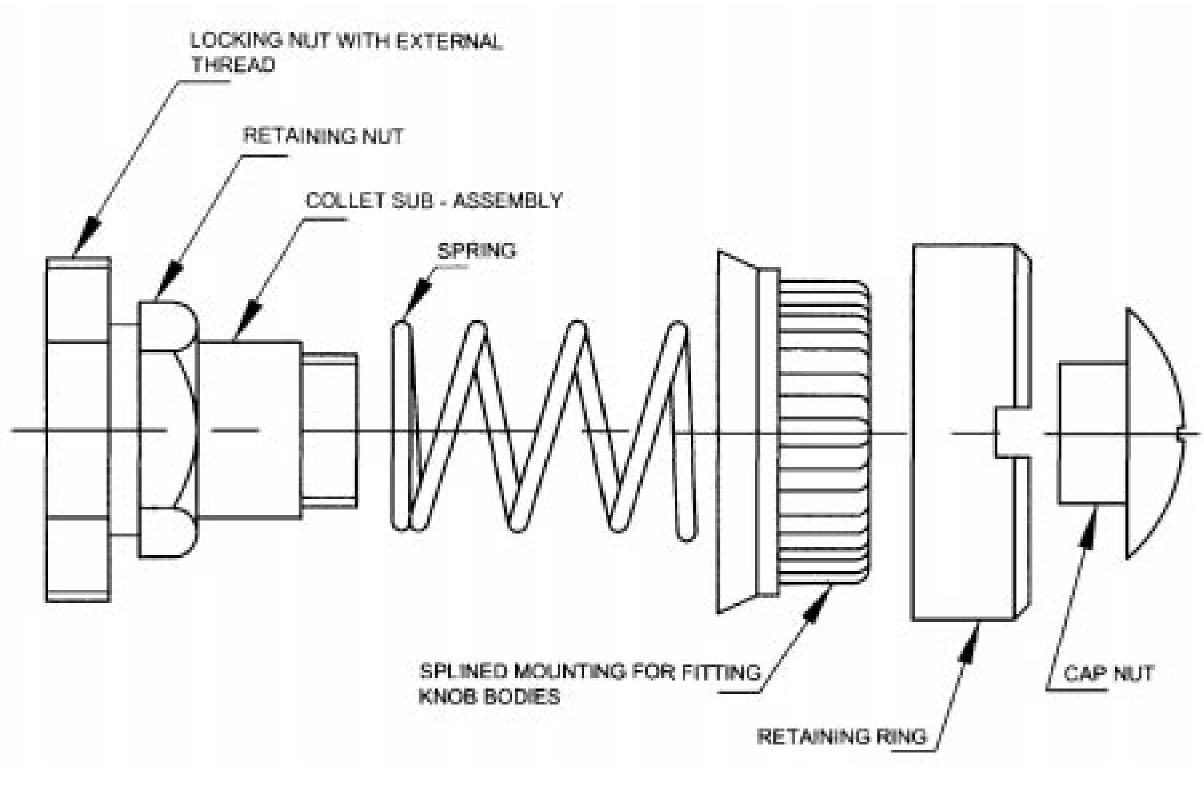

LOCKING NUT WITH EXTERNAL THREAD
RETAINING NUT
COLLET SUB - ASSEMBLY
SPRING
SPLINED MOUNTING FOR FITTING KNOB BODIES
RETAINING RING
CAP NUT

FIG. 1 COLLECT SUB-ASSEMBLY FOR ANTI-VIBRATION KNOBS

7.4.1.2 *Damp heat (accelerated) (first cycle)*

The knobs shall be subjected to the first cycle of this test in accordance with IS 9000 (Part 5). After the specified period of conditioning, the knobs shall be removed from the chamber and allowed to remain under standard recovery conditions appropriate to the test.

After recovery, the knobs shall be subjected to general examination [*see* **7.3.1**(a), (b) and (e)].

There shall be no corrosion or mechanical deterioration or any other visible damage and the markings shall be legible.

7.4.1.3 *Cold*

The knobs fitted on standard spindles by its normal means shall be subjected to this test in accordance with IS 9000 (Part 2). The temperature of test chamber shall be maintained at the appropriate value for the category and the duration of exposure shall be 2 h. Whilst still at this temperature the specimen shall be subjected to following test and shall meet the requirements specified in **7.3.6**.

7.4.1.4 *Damp heat (accelerated) remaining cycles*

The knobs shall be subjected to the remaining number of cycles of this test in accordance with IS 9000 (Part 5).

After specified period of conditioning, the knobs shall be removed from the chamber.

NOTE — Remaining number of damp heat cycles required are as follows:

a) Categories 1 and 2 : 5 cycles

b) Category 3 : 1 cycle

7.4.1.5 *Final measurements*

The knobs shall then be subjected to the following tests in the order given below and shall meet the requirements specified in the relevant clauses:

a) General examination (*see* **7.3.1**),
b) Torque (*see* **7.3.6**),
c) Axial thrust (not required on collect assemblies) (*see* **7.3.7**),
d) Vibration (*see* **7.3.9**), and
e) Compression load (*see* **7.3.6.3**).

7.5 Damp Heat (Long Term Exposure) (Not Applicable for Category 3)

The knobs shall be subjected to this test in accordance with IS 9000 (Part 4). The duration of the exposure shall be appropriate to the relevant category. After the specified period of conditioning the knobs shall be removed from the chamber and subjected to the following tests and shall meet the requirements specified in the relevant clauses:

a) General examination [*see* **7.3.1**(a), (b) and (e)].
b) Torque (*see* **7.3.6**), and
c) Axial thrust (*see* **7.3.7**).

7.6 Rapid Change of Temperature (Not Applicable for Category 3)

This test shall be carried out in accordance with IS 9000 (Part 14). The maximum and the minimum temperatures shall be appropriate to the category of the knobs. The total number of cycles shall be 5. The period of exposure to both maximum and minimum temperatures shall be 1 h each. After the exposure, the knobs shall be removed from the chamber and allowed to recover under conditions appropriate to these tests.

The knobs shall then be subjected to the following tests and shall conform to the requirements specified in the relevant clauses:

a) General examination [*see* **7.3.1**(a), (b) and (e)], and
b) Torque (*see* **7.3.6**).

7.7 Mould Growth

This test shall be carried out in accordance with IS 9000 (Part 10). After the expiry of the specified period of exposure, there shall be no mould growth on the knobs visible to the naked eye.

7.8 Salt Mist

The knobs shall be subjected to this test in accordance with IS 9000 (Part 11) the period of exposure being 4 days.

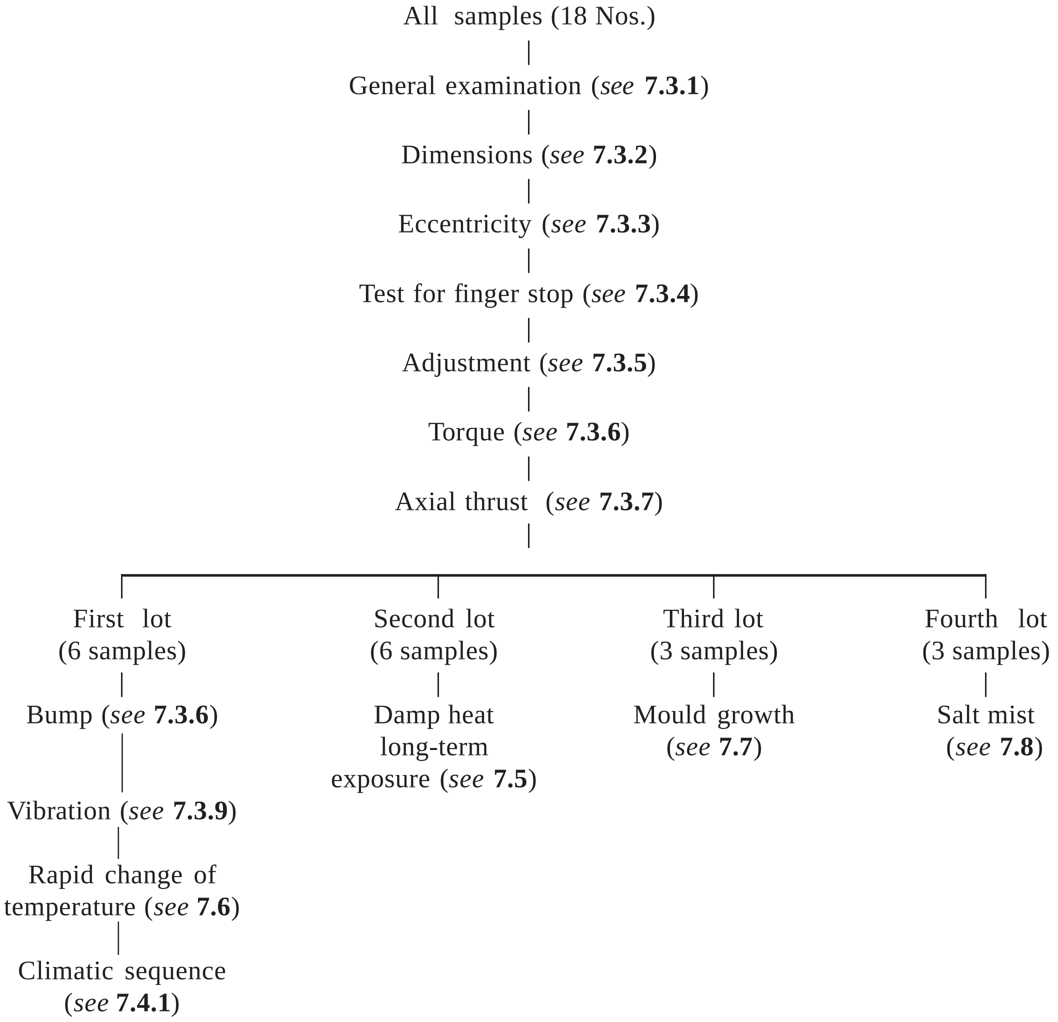
After removal from the chamber, the following tests shall be carried out and shall meet the requirements given in the relevant clauses:

a) General examination [*see* **7.3.1**(a), (b) and (e)], and
b) Torque (*see* **7.3.6**).

ANNEX A

(*Clause* 7.1.1)

SEQUENCE OF TYPE TESTS


All samples (18 Nos.)
General examination (*see* **7.3.1**)
Dimensions (*see* **7.3.2**)
Eccentricity (*see* **7.3.3**)
Test for finger stop (*see* **7.3.4**)
Adjustment (*see* **7.3.5**)
Torque (*see* **7.3.6**)
Axial thrust (*see* **7.3.7**)
First lot (6 samples)
Bump (*see* **7.3.6**)
Vibration (*see* **7.3.9**)
Rapid change of temperature (*see* **7.6**)
Climatic sequence (*see* **7.4.1**)
Second lot (6 samples)
Damp heat long-term exposure (*see* **7.5**)
Third lot (3 samples)
Mould growth (*see* **7.7**)
Fourth lot (3 samples)
Salt mist (*see* **7.8**)

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Amend No.	Date of Issue	Text Affected

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